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Characteristics of Classic Papers of Library and Information Science: A Scientometric Study

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Abstract
Classic papers are novel facilities of Google scholar. These papers were first developed by Google scholar in May 2017. Classic papers have been considered highly cited papers since last 10 years. Effective authors, institutions, universities, and countries on improving science can be identified by analyzing the papers. Therefore, this study aims to examine characteristics of classic papers of Library and Information Science (LIS). This study will use Scientometrics indicators. The study sample includes LIS classic papers. To gather the data, some databases such as Google scholar, Web of Science, and Scopus are applied. Excel and SPSS applications are used for descriptive and statistical analyses. The study data indicate that *Scientometrics journal* covers most classic papers on LIS (5 papers). 60% of the papers are written by more than one author. A paper of "Usage Pattern of Collaborating Tagging System" is highly cited paper of LIS with 3051 and 1308 citations on Google scholar and Scopus respectively. Analysis of authors' affiliation shows that American universities and institutions play considerable role in LIS classic papers. The data of statistical tests indicate that there is a positive significant correlation between citations of classic papers of Google scholar, Scopus and Web of Science.

Keywords: Classic Papers; Highly Cited Papers; Google scholar; Scopus; Scientometrics; Bibliometrics; Library and Information Science.

1. INTRODUCTION

Scientometrics as a scientific field is believed the most common method to evaluate scientific actions[1]. Scientometrics is measurement of science bearing all quantitative methods and patterns related to generating and promoting science and technology[2]. In 1969, Nalimov and Mulchenko created Naukometriya that is Russian equivalent of Scientometrics term. During the years, several definitions of Scientometrics were presented. In 1992, Tague-Sutcliffe defined Scientometrics as studying quantitative aspects of science. He believed that Scientometrics could include a part of sociology of science relatively overlapping with bibliometrics[3]. In 1997, Van Raan thought that Scientometrics would be quantitative studies on science and technology[4]. In 2001, Hood and Wilson believed that Scientometrics could handle entire quantitative aspects of science and communication in science. Gupta and Hasan (2018) suggested that Scientometrics could be a branch of science. With the passage of time, Scientometrics as a remarkable tool to evaluate research performances and scientific outputs has been acquiring favorable position and converting to a powerful means in Science Policy[5,6]. Scientometrics is considered an efficient assessment means for scientific researches[7]. Scientometrics and related fields such as bibliometrics have been conceived by many researchers for recent years[8]. Today, Scientometrics known as an interdisciplinary research field has extended over almost all scientific scopes and has used to describe and anticipate academic status of researchers, educational and research departments, scientific journal, universities, organizations, and countries[9,10,11]. In this regard, numerous indices and techniques have developed to conduct Scientometrics studies[12]. Additionally, authentic databases such as Web of science, Scopus, and Google scholar have developed and presented comprehensive information on the number of published papers and article citations. In fact, establishment of the databases leads to developing modern solid Scientometrics features[13]. To identify the intensity of research outputs, number of publications may be a useful index but it seems insufficient for the quality of them. Therefore, a supplemental index known citation is produced. The more citations of a research output such as a paper, the more high-quality and effectiveness on science field[12]. One of the most modern indices formed based on citations are classic papers. Google Scholar has named these articles "classic articles", because these articles are the highly cited papers in recent decade (2006-2016). Classic papers include authentic research articles but overview articles, status reviews, editorials, guidelines etc. Google scholar has provided the opportunity to identify and extract classic papers of different domains and developed 10 highly cited papers for each domain since 2017[14]. Classic papers of Google scholar entirely reflecting professional fields can be beneficial for researchers and experts. These articles have been the most cited and used in the last 10 years and helped scientific society improve various subject areas. Library and Information science as a professional area that is very close to Scientometrics studies is not exceptional. In turn, LIS papers contribute to development of knowledge of this area and have effect on extending knowledge borders of LIS field. Numerous LIS researchers and experts do not have enough familiarity with classic papers and they are not aware of their importance. Scientometrics study could be a road map for LIS researchers and experts and help them select their research field. Since, there has been no research of LIS classic papers so far, analyzing classic papers using Scientometrics techniques and indices including citations, SJR, FWCI, Citation Benchmarking, H-Index, Impact Factor, and Authorship Pattern could suggest precious data to academic community of LIS as well as providing new paths to conduct efficient, authentic, and beneficial researches.

2. LITERATURE REVIEW

Classic papers were first introduced by Google scholar in May 2017. However, there had already been researches of highly cited papers that we will discuss.

In a study, Iyanovic′ and Ho[15] identify and analyze the characteristics of LIS highly cited papers on Social Science Citation Index. The data indicate that 26% of highly cited papers have been published on MIS Quarterly. Harvard University is the most productive university. Most authors are from University of Maryland. 67% of highly cited papers have been written by the USA researchers.

In a study, Moral-Munoz etal[16] examine highly cited papers of Intelligent Transportation Systems. In this study, they identify leading authors, nations, and institutions. The data show that the USA universities and institutions are the most excellent dealing with highly cited papers.

In a study "Highly-cited papers in Library and Information Science", Bauer; Leydesdorff and Bornmann[17] examine the highly cited papers of Web of Science (WoS) in 2002-2012. The data indicate that the highest number of articles is dedicated to the authors of Harvard University. "Collection and Exploitation in Information in Clinical Practices", "The Use of Internet in Public Communication and Commerce", and "Scientometrics" are considered important fields of Library and Information science.

Garousi and Fernandes[18] examine highly cited papers of computer engineering through Scientometrics. The study data indicate that the most highly cited papers included 1817 citations published in 1994. The data also show that based on yearly citations mean a leading article contained 152 citations published in 2004.

Elango and Ho[19] examine highly cited papers of Indian authors on Science Citation Index Expanded Database. The data show that articles with co-authorship or international collaboration may receive more citations. The USA is thought the best country for international collaboration.

Martin-Del-Rio etal[20] identify and analyze highly cited papers on nurses' stress through retrospective bibliometric analysis. The data indicate that the authors of highly cited papers come from the UK and USA.

3. OBJECTIVES

The study has been conducted with the aim of Scientometrics analysis of LIS highly cited papers. The main purposes of the study include as follows:

- Identification of journals published LIS classic papers
- Examination of citation performance of journals publishing LIS classic papers
- Identification of authorship pattern of LIS classic papers
- Correlation between citations of classic papers on Google scholar, Scopus and Web of Science.
- Correlation between Field-Weighted Citation Impact and Google scholar Citations
- Examination of authors' affiliation writing LIS classic papers

4. METHODOLOGY

This present study is applied in terms of purpose and is descriptive in terms of approach. This study is carried out using Scientometrics indices. The research community includes LIS classic papers. As previously mentioned, classic papers are highly cited papers of the world in the last 10 years (2006-2026). Classic papers include authentic research articles but overview articles, status reviews, editorials, guidelines etc. Google scholar first developed 10 highly cited papers as classic articles for single area in May 2017. Therefore, in this study, all LIS classic papers have been reviewed. In addition to Google scholar, databases of Web of Science have been used to gather data. For descriptive and statistical analyses, Excel and SPSS applications have been used. The research steps, source, and output of each step are presented in Table 1.

Table1. Research steps, process, and output of each step

NO.	Research steps	Source/application	Output of the step
1	Classic paper extraction	Google scholar	Classic papers and journals publishing the papers
2	Identification of citation indices of journals publishing classic papers	Web of Science: JCR Scopus: SJR	SJR, impact factor, h-index
3	Study of the status of authors of classic papers	Google scholar, Web of Science, Scopus	Authorship pattern
4	Study of the status of citations of classic papers	Google scholar, Scopus and Web of Science	Citations, FWCI indices and Citation Benchmarking
5	Extraction of authors' affiliation	Google scholar & Scopus	authors' affiliation
6	Performing correlation tests	Excel & SPSS	Correlation between variables

Findings

Table 2 shows the journals publishing LIS classic papers. The data indicate that classic papers are published in 5 journals including;

- Journal of Information Science (1 paper)
- Journal of the American Society for Information Science and Technology (2 papers)
- Scientometrics (5 papers)
- PLoS Biology (1 paper)
- arXiv prep
- rint cs/0606079 (1 paper)

Scientometrics journal contains the most classic papers with 5 papers and it is ranked first. Journal of the American Society for Information Science and Technology is ranked second with 2 papers. Journal of Information Science, PLoS Biology, and arXiv preprint also published an article each.

Table2. Journals publishing LIS classic papers

NO.	Classic paper title	Journal title
1	Usage patterns of collaborative tagging systems	Journal of information science
2	CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature	Journal of the American Society for Information Science and Technology
3	Theory and practise of the g-index	Scientometrics
4	Citation advantage of open access articles	PLoS Biology
5	Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups	Scientometrics
6	A Hirsch-type index for journals	Scientometrics
7	A framework for authorship identification of online messages: Writing-style features and classification techniques	Journal of the American Society for Information Science and Technology
8	Is it possible to compare researchers with different scientific interests?	Scientometrics
9	Ten-year cross-disciplinary comparison of the growth of open access and how it increases research citation impact	arXiv preprint cs/0606079
10	Journal status	Scientometrics

Table 3 shows the citation performance of the journals publishing LIS classic papers. In this table, Country, Publisher, SJR, CiteScore, Impact Factor, Quartile, and h-index are presented.

Table3. Citation performance of the Journals publishing LIS classic papers

Journal title	Country	Publisher	SJR 2017	CiteScore 2017	impact factor 2017	Quartile	h-index
Journal of information science	United States	SAGE Publications	0.674	2.09	1.93	1	54
Journal of the American Society for Information Science and Technology	United States	John Wiley and Sons Inc.	N/A	N/A	2.83	1	N/A
Scientometrics	Netherlands	Springer	1.125	2.72	2.147	1	90
PLoS Biology	United States	Public Library of Science	4.941	6.79	9.797	1	214
arXiv preprint	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Due to the data of table 3, 3 journals of 5 publishing classic papers are located in the United States. The highest h-index, Impact Factor, CiteScore, and SJR belong to PLoS Biology. The

important point of the citation performance of the journals is that all of the journals are in the first quartile (Q1).

Authorship pattern of LIS classic papers are shown in Table 4. Due to the data of Table 4, 4 LIS classic papers of 10 have one single author and 6 papers are written by more than two authors. In the other words, 60% of classic papers are written in group.

Table4. Authorship pattern of LIS classic papers

NO.	Classic paper title	Authorship Pattern	Authors
1	Usage patterns of collaborative tagging systems	2 Authors	Golder, S.A. & Huberman, B.A
2	CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature	1Authors	Chen, Chaomei
3	Theory and practise of the g-index	1 Authors	Egghe, Leo
4	Citation advantage of open access articles	1 Authors	Eysenbach, Gunther
5	Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups	1 Authors	Van Raan, Anthony F.J.
6	A Hirsch-type index for journals	3 Authors	Braun, T.; Glänzel, W. & Schubert, A.
7	A framework for authorship identification of online messages: Writing-style features and classification techniques	4 Authors	Zheng, R., Li, J., Chen, H., Huang, Z.
8	Is it possible to compare researchers with different scientific interests?	4 Authors	Batista, P.D., Campiteli, M.G., Kinouchi, O., Martinez, A.S.
9	Ten-year cross-disciplinary comparison of the growth of open access and how it increases research citation impact	3 Authors	Hajjem, C., Harnad, S., Gingras, Y
10	Journal status	3 Authors	Bollen, J., Rodriquez, M.A., Van De Sompel, H.

In table 5, citations of LIS classic papers on Google scholar, Scopus and Web of Science are shown. The data indicate that the paper "Usage Pattern of Collaborating Tagging System" is ranked first with 3015, 1314 and 800 citations on Google scholar, Scopus and Web of Science respectively. This paper is the most LIS highly cited paper in the last 10 years. Additionally, the data of table 5 show that the least citations on Google scholar, Scopus and Web of Science are 410, 262 and 212 respectively. Due to the comparison between Google scholar, Scopus and Web of Science it could be said that the citations of papers on Google scholar is more than Scopus and Web of Science. This fact exists in all LIS classic papers.

Table5. Citations of LIS classic papers on Google scholar and Scopus

NO.	Classic paper title	Google scholar Citations (Rank)	Scopus Citations (Rank)	Web of Science (Rank)
1	Usage patterns of collaborative tagging systems	3051 (1)	1314 (1)	800 (1)
2	CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature	1660 (2)	647 (3)	534 (3)
3	Theory and practice of the g-index	1473 (3)	834 (2)	758 (2)
4	Citation advantage of open access articles	659 (4)	337 (5)	252 (7)
5	Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups	608 (5)	356 (4)	329 (4)
6	A Hirsch-type index for journals	564 (6)	303 (7)	288 (5)
7	A framework for authorship identification of online messages: Writing-style features and classification techniques	502(7)	321 (6)	212 (8)
8	Is it possible to compare researchers with different scientific interests?	500(8)	290 (8)	268 (6)
9	Ten-year cross-disciplinary comparison of the growth of open access and how it increases research citation impact	411(9)	N/A	N/A
10	Journal status	410(10)	262 (9)	N/A

Pearson correlation test is used to examine the correlation of the citations of LIS classic papers on Google scholar, Scopus and Web of Science. The data of correlation test in Table 6 indicate that there is a positive significant correlation between the citations of Google scholar, Scopus and Web of Science. This means that with increasing citations of an article on Google scholar, Scopus and Web of Science citations will also increase.

Table6. Correlations between Google scholar, Scopus and Web of Science citations

		Scopus Citations	Web of Science
Google scholar Citations	Pearson Correlation	.980**	.894**
	Sig. (2-tailed)	.000	.003
**. Correlation is significant at the 0.01 level (2-tailed).			

The results of Field-Weighted Citation Impact and Citation Benchmarking are shown in Table 7. As shown in table 7, the highest FWCI of classic papers is 101.21 belonging to "Usage Pattern of Collaborating Tagging System". All papers of Citation Benchmarking is also 99th percentile.

Table7. FWCI and Citation Benchmarking of LIS classic papers

NO.	Classic paper title	Google scholar Citations (Rank)	FWCI (Rank)	Citation Benchmarking
1	Usage patterns of collaborative tagging systems	3051 (1)	101.21	99th percentile
2	CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature	1660 (2)	18.04	99th percentile
3	Theory and practise of the g-index	1473 (3)	39.63	99th percentile
4	Citation advantage of open access articles	659 (4)	19.89	99th percentile
5	Comparison of the Hirsch-index with standard bibliometric indicators and with peer judgment for 147 chemistry research groups	608 (5)	32.97	99th percentile
6	A Hirsch-type index for journals	564 (6)	20.27	99th percentile
7	A framework for authorship identification of online messages: Writing-style features and classification techniques	502(7)	5.65	99th percentile
8	Is it possible to compare researchers with different scientific interests?	500(8)	26.18	99th percentile
9	Ten-year cross-disciplinary comparison of the growth of open access and how it increases research citation impact	411(9)	N/A	N/A
10	Journal status	410(10)	17.3	99th percentile

The data of Pearson test in Table 8 indicate that there is a positive significant correlation between Field-Weighted Citation Impact and Google scholar Citation. This means that with increasing citations of an article on Google scholar Citation, Field-Weighted Citation Impact will also increase.

Table8. Correlations between and FWCI and Google scholar Citations

		Google scholar Citations	FWCI
Google scholar Citations	Pearson Correlation	1	.867**
	Sig. (2-tailed)		.002
FWCI	Pearson Correlation	.867**	1
	Sig. (2-tailed)	.002	
**. Correlation is significant at the 0.01 level (2-tailed).			

Frequency distribution of the authors of LIS classic papers dealing with organizational affiliation is shown in Table 9. Totally, 23 authors collaborate on writing LIS classic papers. 9 authors out of 23 are from The United States, 4 from Brazil, 4 from Canada, 2 from Belgium, 2 from Hungary, 1 from Netherland, and 1 author is from China. Therefore, it can be said that US universities and institutions have had the most role in LIS classic papers.

Table9. Distribution of the authors of LIS classic papers

NO.	Name of Contributor	Author ID	Country	Affiliation
1	Golder, Scott A.	14035595100	United States	Cornell University
2	Huberman, Bernardo A.	7006353402	United States	Hewlett Packard Laboratories
3	Chen, Chaomei	7501950297	United States	Drexel University
4	Egghe, Leo	56259678000	Belgium	Universiteit Hasselt
5	Eysenbach, Gunther	55995154400	Canada	University Health Network University of Toronto
6	Van Raan, Anthony F.J.	7004058552	Netherlands	Leiden University
7	Braun, Tibor	7202108106	Hungary	Magyar Tudomanyos Akademia
8	Glänzel, Wolfgang	7003697821	Belgium	KU Leuven
9	Schubert, Andreas P.	15319510300	Hungary	Magyar Tudomanyos Akademia
10	Zheng, Rong	36846490100	China	Hong Kong University of Science and Technology
11	Li, Jiexun	14219309800	United States	Western Washington University
12	Chen, Hsinchun	8871373800	United States	University of Arizona
13	Huang, Zan	7406221043	United States	Pennsylvania State University
14	Batista, Pablo Diniz	14049804500	Brazil	Brazilian Center for Research in Physics
15	Campiteli, Mônica Guimarães	14049825000	Brazil	Universidade de Sao Paulo
16	Kinouchi, Osame	6701584586	Brazil	Universidade de Sao Paulo
17	Martinez, Alexandre Souto	7404026058	Brazil	Universidade de Sao Paulo
18	Hajjem, Chawki	24179385600	Canada	Universite du Quebec a Montreal
19	Harnad, Stevan	26643216300	Canada	Universite du Quebec a Montreal
20	Gingras, Yves	6602494616	Canada	Universite du Quebec a Montreal
21	Bollen, Johan	6603686592	United States	Indiana University
22	Rodriquez, Marko A.	35827098100	United States	Los Alamos National Laboratory
23	Van De Sompel, Herbert	6602198600	United States	Los Alamos National Laboratory

Discussion and conclusion

The present research is conducted with the aim of studying characteristics of LIS classic papers. The data indicate that classic papers are published in five journals as follows: Journal of Information Science, Journal of the American Society for Information Science and Technology, Scientometrics, PLoS Biology, arXiv preprint cs/0606079. Scientometrics journal containing 5 classic papers is ranked first. Scientometrics journal is one of the leading journals on Scientometrics field and other related areas such as Bibliometrics and

Webometrics. This journal was founded by Tibor Braun Editor in Hungary in 1978. The reason of such an outcome could be the interest of LIS research professionals in Scientometrics field. This issue is clear in the title of classic papers. 5 classic papers out of 10 are in Scientometrics field. This result is consistent with the study data of Bauer, Leydesdorff & Bornmann[17]. Their research findings dealing with highly cited papers of Web of Science (WoS) show that Scientometrics is one of three important fields of LIS. Therefore, it could be said that the papers published in Scientometrics field are believed more highly cited than other LIS fields and they are more likely to be included in the list of highly cited papers. Citation performance of the journals publishing LIS classic papers indicates that all the journals are in the first quartile (Q1). This suggests that Q1 journal articles are more likely to receive citations. Therefore, authors desiring their articles to be republished must publish them in Q1 journals. In fact, the journals with higher h-index, Impact Factor, CiteScore, and SJR will receive much more citations. Authorship pattern of classic papers shows that 60% of the classic papers have been written in group. In research of Elango & Ho[19], the review of Indian authors' highly cited papers on Science Citation Index Expanded Database indicates that articles that are co-authored or internationally co-collaborated can receive more citations. These findings illustrate the importance of collaboration and co-authorship. Gradually, collaboration has become the mainstream of scientific research and helps to improve the level of scientific research[21]. In fact, collaboration is considered an inevitable necessity in scientific advances[22]. Looking at the dramatic increase in co-authored papers, we must say that scientific collaboration is a necessary condition for modern science and the present time. While collaborating, researchers share ideas, produce novel knowledge, and finally, develop innovation and productivity increase[23]. In various studies, the relationship between scientific collaboration and better quality of works[24], the relationship between international collaboration and Impact Factor of journals[25], the relationship between scientific collaboration and productivity[26], and the relationship between scientific collaboration and citation[27,28,29] have been confirmed. The citations of classic papers on Google scholar, Scopus and Web of Science indicate that the least cited papers on Google scholar, Scopus and Web of Science are 410, 262 and 212 respectively. Therefore, it can be said that if an author desires his article to be in the category of classic papers, his article should receive more than 200 citations. The comparison of the citations on Google scholar, Scopus and Web of Science suggests that citations of papers on Google scholar are much more than Scopus and Web of Science. The research of Bauer and Bakkalbasi[30] on examination of JASIST paper citations shows that the citations of articles on Google scholar are much more than Scopus and Web of Science. The abundance of citations of papers on Google scholar is that Google scholar automatically detects and indexes papers in the Web environment but Scopus and Web of Science have their own policy in choosing journals and do not add any journal to their index[31]. Considering that Google scholar, Scopus and Web of Science are prominent citation databases in the world, Pearson correlation test is used to examine the correlation of the citations of these three databases. The data of Pearson test indicate that there is a positive significant correlation between the citations of Google scholar, Scopus and Web of Science. On the other words, with increasing citations of an article on Google scholar, Scopus and Web of Science citations will also increase. This result is consistent with the research findings of Bauer and Bakkalbasi[30]. The last finding of the present research is evaluating the authors of classic papers dealing with organizational affiliation. The result suggests that 9 out of 23 authors are from The United States. Thus, we must admit that USA universities and

institutions play the most roles in LIS classic papers. In almost all researches[15,16,17,19,20], The United States is believed the most influential country at highly cited, high quality, and efficient papers. Therefore, collaborating with American authors can lead to high quality and cited articles.

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